AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, and an electronic sequencing controller for operating said valves in timed relationship with the changing volume of each chamber, wherein the electronic sequencing controller ~~is arranged to~~has a configuration to operate the valves of each chamber in one of an idling mode, a partial mode in which only part of the usable volume of the chamber is used, and a full mode in which all of the usable volume of the chamber is used, and the electronic sequencing controller ~~is arranged to~~has a configuration to select the mode of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine.

2. (Original) A machine according to claim 1, wherein the partial mode comprises the use of only a small fraction of the usable volume of the chamber.

3. (Previously Presented) A machine according to claim 1, operable as both a pump and a motor, each chamber having five selectable modes, namely idling mode, partial motoring mode, full motoring mode, partial pumping mode and full pumping mode.

4. (Previously Presented) A machine according to claim 1 wherein the working chambers comprise cylinders in which pistons are arranged to reciprocate.

5. (Original) A machine according to claim 4, wherein partial pumping mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead centre position of the piston.

6. (Original) A machine according to claim 4, wherein partial motoring mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low-pressure manifold a small fraction after the top dead centre position of the piston.

7. (Currently Amended) A method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of each chamber in one of an idling mode, a partial mode in which only part of the usable volume of the chamber is used, and a full mode in which all of the usable volume of the chamber is used,

wherein the mode of each chamber is selected on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine.

8. (Original) A method according to claim 7, wherein the partial mode comprises the use of only a small fraction of the usable volume of the chamber.

9. (Currently Amended) A method according to claim 7, further comprising selecting the number of chambers to be operated in each of said modes according to an algorithm depending on the actual and required output of the machine.

10. (Currently Amended) A method according to claim 9, ~~including a preliminary step of~~further comprising:

selecting whether to operate the machine as a pump or a motor[[,]]; and

choosing the algorithm accordingly.

11. (New) A method according to claim 7, wherein the fluid-working machine is operated as a motor.

12. (New) A method according to claim 11, wherein:

the working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low-pressure manifold a small fraction in advance of the top dead center position of the piston.

13. (New) A method according to claim 7, wherein:

the fluid-working machine is operated as a pump;

said working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead center position of the piston.

14. (New) A method according to claim 7, further comprising operating the valves of each chamber in a mode selected from: an idling mode, a partial motoring mode, a full motoring mode, a partial pumping mode and a full pumping mode.

15. (New) A method according to claim 7, wherein at low flows, said operating the valves includes an operation sequence composed of partial stroke and idling modes with the fraction of the two modes reflecting a demand level.

16. (New) A method according to claim 15, wherein as flow demand increases, the fraction of partial stroke modes relative to idling modes increases.

17. (New) A method according to claim 7, wherein at sufficient flow demand, the method further comprises using occasional full modes interspersed with idle and part modes.

18. (New) A method according to claim 7, wherein;

when flow demand is below full flow output but above a fixed or variable threshold, idling modes are interspersed with full modes; and

when flow demand falls below a fixed or variable threshold, idle modes, part modes and full modes are mixed.

19. (New) A method according to claim 7, wherein in the partial mode, valve actuations are delayed until almost the end of a stroke.

20. (New) A method according to claim 19, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by stability of valve operation at a low flow end.

21. (New) A method according to claim 19, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by machine noise at a higher flow end.

22. (New) A method according to claim 7, wherein the partial mode is distinct from both the idling mode and the full mode.

23. (New) A method according to claim 7, wherein in a full stroke pumping mode, the transition from intake from the low-pressure manifold to exhaust to the high-pressure manifold takes place near bottom dead center.

24. (New) A method according to claim 7, wherein when the mixture of modes of operation is tailored for one or more of the smoothest flow result, the most seamless change in audible noise, minimal pressure ripple, and optimum actuator motion.

25. (Newly Presented) A method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, said working chambers comprising cylinders within which pistons are arranged to reciprocate, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of a said working chamber in a partial motoring mode in which only part of the usable volume of the chamber is used.

26. (New) A method of operating a fluid-working machine according to claim 25, further comprising closing the valve linking at least one of said working chambers to the high-pressure manifold and opening the valve linking the at least one working chamber to the low-pressure manifold a small fraction in advance of the top dead center position of the piston of the at least one working chamber.

27. (New) A method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of each chamber to select the mode of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine,

wherein at low flows, operating the valves includes an operation sequence composed of partial strokes in which only part of the usable volume of the chamber is used and idling modes with the fraction of the two modes reflecting a demand level.

28. (New) A machine according to claim 1, wherein the electronic sequencing controller has a configuration to select the number of chambers to be operated in each of said modes according to an algorithm depending on the actual and required output of the machine

29. (New) A machine according to claim 28, wherein the electronic sequencing controller has a configuration to select whether to operate the machine as a pump or a motor; and

choose the algorithm accordingly.

30. (New) A machine according to claim 1, wherein the fluid-working machine is operated as a motor.

31. (New) A machine according to claim 30, wherein:

the working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low-pressure manifold a small fraction in advance of the top dead center position of the piston.

32. (New) A machine according to claim 1, wherein:

the fluid-working machine is operated as a pump;

said working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead center position of the piston.

33. (New) A machine according to claim 1, wherein the electronic sequencing controller has a configuration to operate the valves of each chamber in a mode selected from: an idling mode, a partial motoring mode, a full motoring mode, a partial pumping mode and a full pumping mode.

34. (New) A machine according to claim 1, wherein at low flows, said electronic sequencing controller operates the valves with an operation sequence composed of partial stroke and idling modes with the fraction of the two modes reflecting a demand level.

35. (New) A machine according to claim 34, wherein as flow demand increases, the fraction of partial stroke modes relative to idling modes increases.

36. (New) A machine according to claim 1, wherein at sufficient flow demand, the electronic sequencing controller operates the valves using occasional full modes interspersed with idle and part modes.

37. (New) A machine according to claim 1, wherein;

when flow demand is below full flow output but above a fixed or variable threshold, idling modes are interspersed with full modes; and

when flow demand falls below a fixed or variable threshold, idle modes, part modes and full modes are mixed.

38. (New) A machine according to claim 1, wherein in the partial mode, valve actuations are delayed until almost the end of a stroke.

39. (New) A machine according to claim 38, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by stability of valve operation at a low flow end.

40. (New) A machine according to claim 38, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by machine noise at a higher flow end.

41. (New) A machine according to claim 1, wherein the partial mode is distinct from both the idling mode and the full mode.

42. (New) A machine according to claim 1, wherein in a full stroke pumping mode, the transition from intake from the low-pressure manifold to exhaust to the high-pressure manifold takes place near bottom dead center.

43. (New) A machine according to claim 1, wherein when the mixture of modes of operation is tailored for one or more of the smoothest flow result, the most seamless change in audible noise, minimal pressure ripple, and optimum actuator motion.

44. (New) A fluid-working machine comprising:

a plurality of working chambers of cyclically changing volume, said working chambers comprising cylinders within which pistons are arranged to reciprocate,

a high-pressure fluid manifold;

a low-pressure fluid manifold;

at least one valve linking each working chamber to each manifold,

a controller having a configuration to operate the valves of at least one of said working chambers in a partial motoring mode in which only part of the usable volume of the at least one working chamber is used.

45. (New) A machine according to claim 44, wherein:

the controller has a configuration to close the valve linking the at least one working chamber to the high-pressure manifold, and open the valve linking the at least one working chamber to the low-pressure manifold a small fraction in advance of the top dead center position of the piston of the at least one working chamber.

46. (New) A fluid-working machine comprising:

a plurality of working chambers of cyclically changing volume;

a high-pressure fluid manifold;

a low-pressure fluid manifold;

at least one valve linking each working chamber to each manifold; and

a controller having a configuration to operate the valves of each chamber to select the mode of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine,

wherein at low flows, the controller has a configuration to operate the valves in an operation sequence composed of partial strokes in which only part of the usable volume of the chamber is used and idling modes with the fraction of the two modes reflecting a demand level.

47. (New) A computer readable storage medium to perform a method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of each chamber in one of an idling mode, a partial mode in which only part of the usable volume of the chamber is used, and a full mode in which all of the usable volume of the chamber is used,

wherein the mode of each chamber is selected on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine.

48. (New) A computer readable storage medium according to claim 47, wherein the partial mode comprises the use of only a small fraction of the usable volume of the chamber.

49. (New) A computer readable storage medium according to claim 47, further comprising selecting the number of chambers to be operated in each of said modes according to an algorithm depending on the actual and required output of the machine.

50. (New) A computer readable storage medium according to claim 49, further comprising:

selecting whether to operate the machine as a pump or a motor; and

choosing the algorithm accordingly.

51. (New) A computer readable storage medium according to claim 47, wherein the fluid-working machine is operated as a motor.

52. (New) A computer readable storage medium according to claim 51, wherein:

the working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the high-pressure manifold and opening the valve linking the cylinder to the low-pressure manifold a small fraction in advance of the top dead center position of the piston.

53. (New) A computer readable storage medium according to claim 47, wherein:

the fluid-working machine is operated as a pump;

said working chambers comprise cylinders within which pistons are arranged to reciprocate; and

the partial mode includes closing the valve linking the cylinder to the low-pressure manifold and opening the valve linking the cylinder to the high-pressure manifold a small fraction in advance of the top dead center position of the piston.

54. (New) A computer readable storage medium according to claim 47, further comprising operating the valves of each chamber in a mode selected from: an idling mode, a partial motoring mode, a full motoring mode, a partial pumping mode and a full pumping mode.

55. (New) A computer readable storage medium according to claim 47, wherein at low flows, said operating the valves includes an operation sequence composed of partial stroke and idling modes with the fraction of the two modes reflecting a demand level.

56. (New) A computer readable storage medium according to claim 55, wherein as flow demand increases, the fraction of partial stroke modes relative to idling modes increases.

57. (New) A computer readable storage medium according to claim 47, wherein at sufficient flow demand, the method further comprises using occasional full modes interspersed with idle and part modes.

58. (New) A computer readable storage medium according to claim 47, wherein;

when flow demand is below full flow output but above a fixed or variable threshold, idling modes are interspersed with full modes; and

when flow demand falls below a fixed or variable threshold, idle modes, part modes and full modes are mixed.

59. (New) A computer readable storage medium according to claim 47, wherein in the partial mode, valve actuations are delayed until almost the end of a stroke.

60. (New) A computer readable storage medium according to claim 59, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by stability of valve operation at a low flow end.

61. (New) A computer readable storage medium according to claim 59, wherein a fraction of the volume of a whole cylinder which is displaced in the partial mode extends over a range limited by machine noise at a higher flow end.

62. (New) A computer readable storage medium according to claim 47, wherein the partial mode is distinct from both the idling mode and the full mode.

63. (New) A computer readable storage medium according to claim 47, wherein in a full stroke pumping mode, the transition from intake from the low-pressure manifold to exhaust to the high-pressure manifold takes place near bottom dead center.

64. (New) A computer readable storage medium according to claim 47, wherein when the mixture of modes of operation is tailored for one or more of the smoothest flow result, the most seamless change in audible noise, minimal pressure ripple, and optimum actuator motion.

65. (New) A computer readable storage medium tangibly storing instructions executable by a computer to perform a method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, said working chambers comprising cylinders within which pistons are arranged to reciprocate, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of a said working chamber in a partial motoring mode in which only part of the usable volume of the chamber is used.

66. (New) A computer readable storage medium according to claim 65, wherein a method of operating a fluid-working machine according to claim 25, further comprising closing

the valve linking at least one of said working chambers to the high-pressure manifold and opening the valve linking the at least one working chamber to the low-pressure manifold a small fraction in advance of the top dead center position of the piston of the at least one working chamber.

67. (New) A computer readable storage medium tangibly storing instructions executable by a computer to perform a method of operating a fluid-working machine having a plurality of working chambers of cyclically changing volume, a high-pressure fluid manifold and a low-pressure fluid manifold, at least one valve linking each working chamber to each manifold, the method comprising:

operating the valves of each chamber to select the mode of each chamber on successive cycles of working chamber volume so as to vary the time averaged effective flow rate of fluid through the machine,

wherein at low flows, operating the valves includes an operation sequence composed of partial strokes in which only part of the usable volume of the chamber is used and idling modes with the fraction of the two modes reflecting a demand level.